The JOURNAL OF ELECTRICITY POWER AND GAS

WITH WHICH IS INCORPORATED
The Engineers', Architects' and Builders' News

PUBLISHED WEEKLY

By the Technical Publishing Company, Atlas Building, 604 Mission Street, San Francisco Cal.
Entered as second-class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3, 1879.

Vol. XVIII No. 18 San Francisco, Cal., May 4, 1907. Yearly subscription $2.50 Single copies 10 cents Back numbers prior to current month 25 cents.

OKONITE WIRE

The Standard for Rubber Insulation

Okonite Tape, Manson Tape,
Candee Weather-proof Wire,
Candee (Patented) Potheads.

THE OKONITE COMPANY, 253 BROADWAY, N. Y.

STANDARD UNDERGROUND CABLE CO.

MANUFACTURERS OF

BARE AND INSULATED WIRES AND CABLES

CHICAGO PITTSBURG PHILADELPHIA ATLANTA
NEW YORK BOSTON ST. LOUIS SAN FRANCISCO
LOS ANGELES OAKLAND SEATTLE

PACIFIC COAST DEPT. A. B. SAURMAN Pacific Coast Mgr. BACON BLOCK, OAKLAND, CAL.

Meese & Gottfried Company

19th and Harrison Sts., SAN FRANCISCO

Power Transmitting Machinery

Of all description. We have a larger stock of Shafting, Hangers, Boxes, Pulleys, etc., than ever.

Seattle *San Francisco* *Los Angeles*

VULCAN

Refrigerating and Ice Making Machinery

Manufactured by

VULCAN IRON WORKS

OFFICE: 702 ATLAS BLD'G. 604 MISSION STREET WORKS: FRANCISCO NND KEARNEY STS.

San Francisco, California.

INDIANA RUBBER AND INSULATED WIRE CO.

MANUFACTURERS OF

PARANITE AND PEERLESS RUBBER COVERED WIRES AND CABLES

Underground, Aerial, Submarine and Inside Use
TELEPHONE, TELEGRAPH AND FIRE ALARM CABLES

All Wires are Tested at Factory JONESBORO, IND.

ELECTRIC APPLIANCE CO.

315 Main St., San Francisco Pacific Coast Agents

San Francisco Los Angeles Oakland

HENSHAW, BULKLEY & CO.

STURTEVANT BLOWERS AND EXHAUSTS

219-221 Spear St. San Francisco, Cal.

California Incandescent Lamp Company

Have Reopened at

No. 65 and 60 NATOMA ST.

SAN FRANCISCO

The National Conduit & Cable Co.

Manufacturers of

TROLLEY WIRE

BARE COPPER WIRE AND CABLES
WEATHERPROOF WIRES AND CABLES
PAPER-INSULATED CABLES

FOR TELEPHONE, TELEGRAPH AND POWER

703 MONADNOCK BUILDING, SAN FRANCISCO

C. H. PENNOYER, PACIFIC COAST MANAGER

BROOKS-FOLLIS ELECTRIC CORP.

Electrical Supplies of all Kinds in Stock

214 FIRST STREET, Cor. Tehama SAN FRANCISCO

OAKLAND, 563 13th Street

PACIFIC METER CO.

MANUFACTURERS OF

WET AND DRY GAS METERS, STATION METERS, PROVERS, GAUGES, ETC.

917 AND 918 MONADNOCK BUILDING. SAN FRANCISCO, CAL

VAN EMON ELEVATOR CO.

MANUFACTURERS OF .... HIGH-GRADE ELEVATORS

R. J. DAVIS, President
B. C. VAN EMON, Vice-President and Manager
H. B. RATHBONE, Secretary and Treasurer

NOT IN THE ELEVATOR TRUST

DIRECTORS
Louis F. Monteagle W. P. Plummer
Geo. M. Pinckard R. S. Hunkins

OFFICE AND CONSTRUCTION DEPARTMENT
52 - 54 NATOMA STREET, SAN FRANCISCO

FACTORY AND FOUNDRY
WEST BERKELEY, CAL. (32,000 sq.ft.)

Our Stock Contains

Every essential for the electrical equipment of hydro-electric power plants.

No Water

wheel installation should be figured on until after getting our data as to standard sizes, weight, floor space, etc.

Also **Engine Type Belted Both 2 and 3 Bearing**

Polyphase Induction Motors, Instruments, Fans, Meters, Etc., Always in Stock.

WATER WHEEL TYPE

Revolving Field Alternating Current Generators

The base, bearings and armature are of massive construction to insure ample stiffness under the most severe operative strains.
We have some interesting testimonials from users of our machinery.

STANDARD ELECTRICAL WORKS

58 & 60 Natoma Street **Phone, Temporary 894** SAN FRANCISCO, CAL.

THE

Journal of Electricity, Power and Gas

WITH WHICH IS INCORPORATED

The Engineers' Architects' and Builders' News

VOLUME XVIII. SAN FRANCISCO, CAL., MAY 4, 1907 No. 18

STATION RECORDS

BY J. D. ROSS*

Although the system of records of a lighting and power concern must necessarily differ with varying conditions, there is much in common with all plants, and the student just entering the field may profit much from the experience of those who have been connected with a plant during its installation and as it has grown, have tried to give it a proper system of records.

In arranging such a system for the Seattle municipal plant, we have tried to search out the best ideas from other concerns and modify them and make additions to suit conditions.

Beginning with our hydraulic plant situated in the Cascade Range, forty miles from Seattle, our first record is that of the water level where it leaves Cedar Lake, the impounding reservoir of the plant. This level is taken once a day in order that the amount of water for any future development may be computed from the records of several years.

In a generating station it is usually customary to have but one printed blank ruled in columns with headings for K. W., amperes, volts, power factor, etc., for each generator according to the instruments supplied on the board. In addition to this, a system of automatic records using recording instruments will well repay the cost. These may be made by Bristol meters or by curve tracing meters as in the case of load and power factor. A careful examination of these leads to a better understanding of the problems of transmission and regulation. If automatic records are not used the back of the daily record blank may be ruled in cross section and the load curve filled in each day. The exact records required in a station and also the engineering records of the substation will depend largely on the nature of the service and the switchboard design and of course will differ considerably if steam is used.

A somewhat similar system will be used by the substation operators, but we now have receiving transformers instead of generators and we will have in addition a number of distributing circuits, some of which may be direct current, requiring rotaries or motor generators. The record will have to be arranged to suit these conditions. It should, however, duplicate that at the station as far as possible, in order that a comparison of the two records will show the transmission losses and regulation. Besides the operator's station blanks, there are several needed in the general operating of the plant, and these will be considered together with those used for installation work. In the construction and operation of pole lines and wire lines, several maps are required. The map for recording pole locations may conveniently be drawn to a scale of 100' equals 1". This map shows the location and length of pole, and the scale is large enough to show which side of the street or alley is used. In a fast growing city like Seattle, it is economical to have these records in the hands of one who keeps in touch with the City Engineer's office, so that all poles may be placed in the parking strips or at the edge of sidewalks. On ungraded streets, if grading plans are finished, it is possible to locate poles accurately and save time and money that would be spent in moving them. A map of the above scale may be conveniently made in sections 36 in. x 24 in., and put

THE CITY OF SEATTLE

DEPARTMENT OF LIGHTING AND WATER WORKS

INSTALLATION WORK CARD

ORDER NO. ---
STREET LIGHTING

Date _____

Install at _____

AN INCANDESCENT STREET LAMP

Return this Card with record of material used as indicated on reverse side. Also time record.

REMARKS

_____

_____

_____

CARD 1 OBVERSE

*Lecture Delivered to Class in Electrical Engineering at the University of Washington, Seattle, Wash.

ELECTRIC SERVICE CARD

THE CITY OF SEATTLE—LIGHTING DEPARTMENT

Appl. No..... Date of Order .....

Cut in Service for Residence / Business **Lighting**

At .....

Owner's Name .....

Tenant's Name .....

CITY / CUSTOMER { to furnish the following lamps for which current is required:

INCANDESCENT				ARCS			NERNSTS	
4 C. P.	8 C. P.	16 C. P.	32 C. P.	4 A.	6 A.	7½ A.	..... Glo	..... Glo

Service Crew Foreman Fill Out All Blanks

Date of Cut-in ..... 190...

.....Wire System (2 or 3) .....Side (N. E. or S. W.)

No. of nearest Transformer on bus.....

Service Pole ..... No.....
Owner's Name

Service Pole Location.....

.....

Signature.....

V. B. 448-12-27-06-1M Over

CARD 5 OBVERSE

MATERIAL USED

....x....Bolts	L. Brackets
....x....Bolts	Corner Brackets
ft. No....W. P. Wire	Double Loop Brackets
ft. No....W. P. Wire	Single Loop Brackets
2-pin Cross Arms	Right or Left Brackets
4-pin Cross Arms	Roof Brackets
8-pin Cross Arms	Eye Bolts
Wood Pins	....in. No....Screws
Iron Pins	....x....Lags
Circuit Br.	....x....Lags
Porc. Insul.	....in. Conduit
Glass Insul.	....in. Loom
Cast Washers	Solder
Cut Washers	Flux
Cross Arm Braces	Screws
Tape	lbs. Nails
Screw Hooks	

TIME
.....Hrs. Foreman
.....Hrs. Lineman
.....Hrs. Helper..
.....Hrs. Team....

CARD 5 REVERSE

ELECTRIC SERVICE CARD.

CITY OF SEATTLE—LIGHTING DEPARTMENT

Appl. No..... Date of Order.....

CUT IN MOTOR SERVICE

At.....

For.....

Current is required for the following Motors:

No.	Size in H. P.	D. C. Voltage	A. C. Volt	A. C. Ph.	Customer will

Blanks Below and on Back of Card to be Filled Out by Service Crew Foreman. MUST BE COMPLETE.

Date of Cut In.....190.....

.....Wire System .....Side.
2, 3 or 4 Street or Walk

Connected to Transformer (or bank) No.....
Located at.....

And to transformer (or bank) No.....
Located at.....

Signature.....

CARD 6 OBVERSE

MATERIAL USED

.....x.....Bolts	L. Brackets
.....x.....Bolts	Corner Brackets
ft. No.....W. P. Wire	Double Loop Brackets
ft. No. .....W. P. Wire	Single Loop Brackets
2-pin Cross Arms	Right or Left Brackets
4-pin Cross Arms	Roof Brackets
8-pin Cross Arms	Eye Bolts
Wood Pins	.....in. No....Screws
Iron Pins	.....x.....Lags
Circuit Br.	.....x.....Lags
Porc. Insul.	.....in. Conduit
Glass Insul.	.....in. Loom.
Cast Washers	Solder
Cut Washers	Flux
Cross Arm Braces	Screws
Tape	lbs. Nails

TIME
.....Hrs. Foreman
.....Hrs. Lineman
.....Hrs. Helper.....
.....Hrs. Team.....

CARD 6 REVERSE

up in book form with heavy covers. Each section has its page number corresponding to the same number on an index map drawn to a scale of 800' equals 1". For wiring maps the same scales are convenient, and if the prints are positive the different phases and voltages may be kept distinct by using different colored inks. Cut-ins are best recorded in pencil, as they are subject to change.

In installation work on street arc and street incandescent lamps, we issue a work card containing order number, date, and location, and on the back of the card is a list of material used in this work, with space opposite to insert the amount used by the crew on that work order.

For cut-ins for light and for power the same system may be carried out, but in addition the card will contain the customer's name and house number and application number, as well as information filled in by the inspector as to

ELECTRIC METER CARD

THE CITY OF SEATTLE—LIGHTING DEPARTMENT

Appl. No..... Date of Order.....

Install Meter for Residence / Business Lighting

At .....

Owner's Name.....

Tenant's Name.....

CITY CUSTOMER to furnish the following lamps for which a meter is required:

INCANDESCENT				ARCS			NERNSTS	
4 C. P.	8 C. P.	16 C. P.	32 C. P.	4 A	6 A	7½ A	..... G10	..... G10

Meterman Fill Out Blanks Below

Date Installed.....

Meter No..... Factory No.....

Make.....Type.....

Form .....Class.....

Cap'y.....Amp.....Volt.....Multiplier.....

Location.....

REMARKS

.....

.....

.....

.....

.....

V. B. 381 9-20-3M OVER

CARD 7 OBVERSE

INCANDESCENT LAMPS

Candle Power	4	8	16	32	Candle Power	4	8	16	32
Porches					Pantry				
Halls					Chambers				
Parlor					Basement				
Sitting Room					Attic				
Dining Room					Shed				
Library					Barn				
Kitchen					Shop				
Bath Room					Store				

ARC AND NERNST LAMPS

.....

.....

.....

.....

.....

.....

.....

MATERIAL USED

.....

.....

.....Hrs. Meterman

.....Hrs. Helper....

Signature.....

CARD 7 REVERSE

Quantity of	Material Used	Dollars	Cts.
	Feet No. ..... Wire		
	Feet No. ..... Wire		
	Feet Twin Cable		
	Wood Pins		
	Iron Pins		
	Wood Steps		
	Iron Steps		
	Glass Insulators		
	Porcelain Insulators		
	..... Circuit Breakers		
	..... Circuit Breakers		
	Brady Cutouts		
	Iron ..... Brackets		
	Eye Bolts		
	..... " x ..... " Bolts		
	..... " x ..... " Bolts		
	..... " x ..... " Lag Screws		
	Feet Rope		
	Rope Cleats		
	.....pin Cross Arms		
	.....pin Cross Arms		
	Cut Washers		
	Cast Washers		
	Cross Arm Braces		
	Junction Switches		
	Fuse Blocks		
	Angle Arm Braces		
	Crosby Clips		
	TIME		
	Hours Foreman		
	Hours Lineman		
	Hours Repair Men		
	Hours Ground Men		
	Hours Team		

CARD 2 REVERSE OF CARD 1

CUT OUT CARD.

THE CITY OF SEATTLE—LIGHTING DEPARTMENT

Appl. No..... Date of Order.....

CUT OUT SERVICE

At.....

For.....

.....

Date Cut Out..... .....190..

.....

.....

.....

.....

.....

.....

.....

.....

TIME	
.....Hrs. Foreman	
.....Hrs. Lineman	
.....Hrs. Helper...	
.....Hrs. Team....	

Signature.....

V. H. 384 2-10-06-1M

Over

CARD 10 OBVERSE

MATERIAL RETURNED TO STOCK

.....x....Bolts	.....L. Brackets
.....x....Bolts	.....Corner Brackets
.....ft. No....W. P. Wire	.....Double Loop Brackets
.....ft. No....W. P. Wire	.....Single Loop Brackets
.....2-pin Cross Arms	.....Right or Left Brackets
.....4-pin Cross Arms	.....Roof Brackets
.....8-pin Cross Arms	.....Eye Bolts
.....Wood Pins	.....in. No.....Screws
.....Iron Pins	.....x....Lags
.....Circuit Br.	.....x....Lags
.....Porc. Insul.	. . in. Conduit
.....Glass Insul.	....in. Loom.
.....Cast Washers	.....Solder
.....Cut Washers	.....Flux
.....Cross Arm Braces	.....Screws
.....Tape	.....lbs. Nails

CARD 10 REVERSE

MATERIAL REPORT

LOCATION_____

Power Circuits Const.	
Power Circuits Operat.	
Commercial Lighting Const.	
Commercial Lighting Operat.	
Street Lighting Const.	
Street Lighting Operat.	

DATE_____190__

_____
Foreman

BOLTS					WIRE COPPER		WIRE IRON	
Inches	⅞	¾	⅝	½	Size	Lbs.	Size	Feet
2½					8		12	
3					6		8	
4					4		5/16	
4½					3		7/16	
12					1		CROSS ARMS	
14					1-0		No. of Pins	No.
16					2-0		2	
18					3-0		4	
20					4-0		6	
22							8	
24								

Cast Washers		Wood Pins	
Cut Washers		Iron Pins	
Cross Arm Braces		Screws	
Heel Bolts		Nails, lbs.	

MISCELLANEOUS			
Glass, Large		Arc Lamps	
Glass, small		Duplex Wire, ft.	
Brackets, wood		Brady Cutouts	
Brackets, iron		Rope Cleats	
Brackets, special		Rope, feet	
Pole Steps, wood		Cutters, pole pullers	
Pole Steps, iron		Cutters, lamp pullers	
Circuit Breakers, oak 15 in.		Cutters, cross arms	
Circuit Breakers, oak 30 in.		Cutters, mast arms	
Circuit Breakers, porcelain		Goose Necks	
Circuit Breakers, wood break		Junction Switches	
Circuit Breakers, West. Elec.		Fuse Blocks	
Solder, lbs.		Iron Brace Arms	
Tape, lbs.		Angle Iron Braces	
Wrapping Wire, lbs.		Eye Bolts	
Flux		Crosby Clips	

TRANSFORMERS		
Mfgr.	Watts	Number

TIME				
	No.	Hrs.	Rate	Amount
Lineman				
Groundman				
Foreman				
Team				

CARD 10 A.

ELECTRIC METER CARD.

THE CITY OF SEATTLE—LIGHTING DEPARTMENT

Appl. No..... Date of Order.....

INSTALL METER FOR POWER

At.....

For.....

Meter is required for the following Motors:

No.	Size in H. P.	D. C. Voltage	A. C. Volt.	A. C. Ph.	Remarks

Meterman Fill Out Blanks Below.

Date Installed .....

Meter No.....Factory No.....

Make.....Type.....

Form.....Class.....

Cap'y.....Amp....Volt.....Multiplier.....

Location.....

REMARKS

.....

.....

.....

.....

.....

V. B. 383-2-10-06-1M. **Over**

CARD 8 OBVERSE

MOTORS

Make.....Type.....

Size .. ..H. P. Speed... .....Amp.....

D. C. Voltage..... A. C. Voltage.....

Phase.....Factory No.....

Owned by..... ....City No.....

.....

.....

Make.....Type.....

Size..... ..H. P. Speed.....Amp.....

D. C. Voltage..... A. C. Voltage .....

Phase.....Factory No.....

Owned by..... .....City No.....

.....

.....

Make.....Type.....

Size.....H. P. Speed .....Amp.....

D. C. Voltage..... A. C. Voltage.....

Phase..... .....Factory o.....

Owned by.....City No.....

.....

.....

MATERIAL USED

.....

.....

..... | ..... | Hrs. Meterman

..... | ..... | Hrs. Helper....

Signature.....

CARD 8 REVERSE

METER CUT OUT CARD

THE CITY OF SEATTLE—LIGHTING DEPARTMENT

Appl. No..... Date of Order.....

CUT OUT METERS

At.....

Owner.....

Tenant.....

LAMPS	4 C. P.	8 C. P.	16 C. P.	32 C. P.	SPECIAL
Furnished					
Returned					

.....

Meter No..... Reading..... K. W.

Meter No..... Reading..... K. W.

....Hrs. Meterman

....Hrs. Helper

Signature.....

CARD 9

POLE LINE WORK ORDER AND REPORT

CITY OF SEATTLE, LIGHTING DEPARTMENT.

Order No. P. 300 Date..... 190...

Build the following Lead:—

No.	Date	Length	REMARKS	Labor	Hole Dug	Pole Set	Guys	HOURS TIME Date	Foreman	Linemen	Helpers	Team
1												
2												
3												

CARD 9 A

two or three-wire service, pole, transformer and circuit used.

Meter work cards in addition will have the number and kind of lamps or motors, with the make and number of the meter.

Cut-out cards for both services and meters keep track of material returned and labor necessary in returning it.

We also issue a report sheet to keep track of material used on pole and wire lines.

A customer moves. For the same reason the house number should be recorded on the map rather than the name of the occupant.

Besides the special work order cards for different departments it is convenient to have a miscellaneous work card for line and pole work.

We have found it convenient to issue a separate work order for inside work.

All work orders for outside work are made of strong flexible card.

(To be continued.)

A NEW BUSINESS DEPARTMENT FOR CENTRAL STATIONS IN SMALL CITIES.

By C. E. Stannard.

The working up of the new business of an electric company needs a separate organization in order to be effective. The following scheme is a condensed outline of the organization of such a department, and the subsequent conduct of the completed organization:

The first step in establishing a new business department in cities of 50,000 population and under should be a careful selection of a manager. Among other qualifications, he should be a man of sterling character, having a broad and liberal education; should be versatile and capable of mingling with all classes of people; possessing a thorough knowledge of the electrical business. It is also advisable for him to be well posted on the gas business, thus being able to intelligently meet competition. He should be a man of executive ability and have the faculty of being popular with the public, possessing the ability to manage the employees in his charge.

The city should be divided into ten territories, containing an average of 5,000 people, or 1,250 families. Then subdivide each territory into two districts, one a residence and the other a business. Thus the representatives would have an opportunity of working both classes of trade.

The best plan of compensation for these representatives is that of a certain fixed salary plus a commission, said commission based upon the revenue secured and the value of said revenue. It is recognized that a contract taken, bringing in a certain sum per year, where no expense for construction is necessary, is of greater value to the company than one where a sum equal to the amount received is to be spent for construction work, therefore the first-mentioned contract should pay the representative a larger sum than the latter. In the selection of representatives, it is wise to choose one having necessary qualifications of a power expert. Another should qualify as a sign, window and outlining expert. Another should possess special knowledge pertaining to illuminating engineering. Men thus equipped can assist the other representatives where special technical or expert knowledge is required. Where possible, it is wise for the representatives to be a combination of commercial and electrical engineers. The more knowledge the representatives possess along all lines, the greater the efficiency.

An engineering department can render great assistance to the commercial department by aiding on all large installations of light and power. Their advice is also of value when working on isolated plants, and the two departments should work in unison, one with the other.

The salesroom should be planned to show all electrical devices and appliances, with the proper display of the various kinds of reflectors and glassware designed to properly reflect the light. The effect of decorative lighting should be incorporated; a full supply of staple and fancy electric fixtures should be shown; also different forms of display, window and sign lighting. Electric domestic and industrial appliances should form a permanent part of the office display. It might be advisable to have a line of electric motors, desk, ceiling and exhaust fans, and various styles and forms of electric lamps. A dark room should be prepared for the display of electric lighting, for instance, as shown by reflectors, fixtures, etc.

The wiring and fixture department should be maintained by the company, and should work in connection with the new business department. An arrangement of this character increases the efficiency and the value of the work done by the representatives.

The active officers of the company, the general manager, secretary-treasurer, superintendent, chief engineer, commercial manager, heads of important departments, and one or two representatives should meet at regular stated intervals for the purpose of discussing all new business matters. Suggestions for improvement or work of the department should be taken up and discussed, and it will be found that from the varied interests represented in this committee, many new and original plans will be formulated. Furthermore, a spirit of harmony will be cultivated, which will in turn be transmitted to all departments of the company, a most important factor in the conduct of new business work.

Conduct.

A daily morning meeting should be presided over by the business manager, at which time orders should be given and discussed, reports received from the representatives, giving a record of the previous day's work, preliminary reports presented, showing the nature of the proposed day's work. Matters of mutual interest discussed; verbal reports given by representatives of interesting and important contracts closed; thorough discussions of same will result in creating and maintaining interest and enthusiasm. This meeting should be held for a period of one-half hour. It is the experience of representatives attending meetings, as above described, that the time thus spent is of a most profitable nature, and the efficiency of their work has been increased.

Educational meetings should be held each week. Meetings might be presided over by a chairman, and conducted along the lines of parliamentary law. Educational matters should be taken up and discussed, the meeting usually being held for a two hours' evening session. Papers of interest should be presented and discussed. Debates on pertinent subjects should occur. It might be of interest to have two representatives occasionally give an exhibition of how a sale should be made, one acting as salesman and the other as customer. It might be well to incorporate in this work some of the features found in the scientific study of salesmanship, a course of illuminating and electrical engineering, and a thorough study of all principles involved in the supplying of electricity for light and power.

At the office or salesroom the various electrical appliances and devices should be carefully and thoroughly demonstrated. In fact, the last two or three days of each discount period it might be wise to arrange for a competent person to demonstrate electricity as applied to the various domestic uses, showing, among other interesting things, the chafing dish and various electrical cooking and heating appliances. Neighborhood demonstrations can profitably be given in consumers' homes, allowing the consumer to invite a few special friends. The company demonstrator cooking a meal, and using exclusively electrical appliances. In this way very effective advertising may be accomplished.

Demonstration work can be carried a step further by showing at the office electric motors, fans, samples of signs, window lighting and outlining, and various other ways in which electricity is applied. Money spent in demonstration work usually proves very effective and is rarely wasted.

In organizing this department and carrying forward the work, it is found advisable to first make a house-to-house canvass, carefully carding all prospects, upon the completion of which the company possesses itemized and detailed information showing the amount of possible business to be secured. This information, when tabulated, will be found useful and valuable, and is of particular value when the electric company has competition, either in the form of another electric or gas company. When carded, the names and addresses appearing on said cards provide proper lists to be used in sending out advertising.

Representatives should not only be able to take orders, but possess the ability to sell goods. They should canvass all proposed extensions. One of the most important features of their work is the securing of additional consumption from present consumers. All complaint work should be

carefully followed up, and reports made to the office of all poor service, making sure that such service is remedied. Representatives play a most important part in popularizing the company and in lessening of competition. It is important that they watch all new buildings, making sure that all electrical features are incorporated during their construction; that feeds are of sufficient size to take care of lighting other than the interior system; for instance, sign lighting, window lighting, display and outlining. They should visit architects and builders, interesting them in electricity for both domestic and industrial use.

The holding of business already secured is a most important feature of a representative's work. I deem it unwise to ever discontinue any business simply upon the request of a consumer. It will be found in many instances that much business can be held by a representative calling on the consumer. They can aid the advertising work by supplying the one having charge of the advertising with valuable and detailed information.

It is profitable to assign men to work exclusively upon increasing the consumption of present consumers, explaining to them and interesting them in the installation of additional domestic appliances; also decorative lighting and power.

The new business manager should have direct charge of the advertising, changing daily the ads appearing in the newspapers. He should select the souvenirs, possibly conferring with the representatives as to what they believe to be proper and effective ones.

A daily record should be compiled, by the office department, and given to the representatives, showing the appliances and orders taken and complaints registered. Thus he is enabled to keep in close touch with all business transpiring on his territory, whether of a personal nature or coming through the office.

Novel ways for applying electricity include its use for house-cleaning, the mercury rectifier, electro-magnets for maturing coffee, electric machine for cutting dress patterns, arcs for promoting steady and rapid growths of vegetables, arcs over oil tanks for bug extermination, and arc and vacuum for taking and printing pictures.

The representative should occasionally go over his own business territory at night, thus determining where the dark spots are, and seeking to interest merchants in various forms of display lighting. Again, demonstrating to the merchant who has a dark store the value of his neighbors' brilliantly-illuminated windows or stores. Representatives might occasionally go over their neghbors' territories at night, reporting at the next morning meeting suggestions whereby he would seek to improve the conditions found.

Results can and have been secured, more than compensating many companies for the money spent in the new business department. Specifically speaking, through this department, the consumption per kilowatt per inhabitant can be materially increased. This is true, also, of the consumption per consumer, and the consumption per sixteen-candlepower-lamp connected. This department is an important factor in reducing the manufacturing costs per kilowatt; also reducing the costs per kilowatt delivered to the consumers, which necessarily increases the company's profits. The department should be an important factor in increasing the daily load at all times except at the peak, thus lessening the amount of current losses, reducing the cost per kilowatt for manufacture and distribution, increasing relatively the profit.

It is further found that each prospect secured serves to assist in developing new ones. It will further be found that the field is inexhaustible. While in some instances the costs to secure new business the first year seems high, the fact must be taken into consideration that the business thus secured remains with the company for years, and is of no further cost. It is not an unusual thing for a new business department to receive in revenue, the first year, three or four times the original investment.

COPPER MARKET SITUATION.

There have been no large blocks of copper selling in this country lately, and recent business among the local trade has moved slowly, with inquiries on a limited scale, says "Copper Gossip." In the present temper of the market consumers hesitate to buy heavily for future delivery and are waiting for stronger incentives before placing fresh orders. Quotations from first hands are 25¼ for Electrolytic Wire Bars and 25½@26 for Lake brands. There have been frequent rumors and reports of late of lower prices than those above mentioned, but they do not come from any of the leading producers. The effect, however, is confusing and reflects a conflict of opinion in copper circles as to the actual position of the market. The apathy of buyers is therefore not to be wondered at. Consuming requirements will have to be more urgent than at present before buyers will be tempted to pay the prices now quoted for distant futures.

As conditions look to us, it is not a time for manufacturers to add heavily to their stocks unless they are compelled to, and the hand-to-mouth policy is the one that strikes us as the one most consistent with conservative business principles. If the recent unprecedented industrial demand of the country should slacken it would be reasonable to expect that the markets for raw materials generally will find a more normal and, consequently, a more healthy level. A readjustment in the business situation at large would also probably mean a revision of copper prices too. Nothing short of a constant demand up to the full limit of production will be sufficient to keep copper at the present level throughout the entire year. If consumers were able to purchase copper with the price guaranteed not to exceed that in force on dates of deliveries, there would then be decided encouragement to operate every manufacturing plant up to the highest limit of capacity. The initiation of such a plan would be hailed with approval by consumers and its operation prove a strong factor in maintaining steady market conditions.

Production is at a rate requiring a great distribution of copper, and should any accumulation arise market unsettlement would undoubtedly follow. Demand has hitherto prevented unfavorable statistics, but we think the position will be tested in the second half of the year. Under existing conditions the plan of buying months ahead at a flat price involves too great a risk. An enormous consumption is necessary to use up the total tonnage supplied by the mines of this and other countries, and it should be remembered that production is expected to increase.

MOTORS FOR OPERATING VALVES AT THE "KERN RIVER STATION NO. I" OF THE LOS ANGELES EDISON COMPANY.

The electrically operated valve is a mechanical refinement demanded by the size of recent hydraulic and hydro-electric developments, where the necessary control of vast volumes of water requires valve openings which it would be practically out of the question for the station attendants to operate without the application of power. About 120 miles from Los Angeles, California, in the canyon of the Kern River, a new power house, being completed by the Los Angeles Edison Company, is ready to supply electric power to the city from 43,000 horsepower in Allis-Chalmers horizontal water wheels. The power plant will be equipped with valves electrically operated by means of eight type "K" Allis-Chalmers direct current motors. They will be used on 28-inch gate valves built by the Risdon Iron and Locomotive Works, of San Francisco. These motors are of the vertical type, series wound, 4 horsepower each. They are totally enclosed, and so arranged that they may be controlled directly from the power house.

Electrical Construction for the Architect

TELEPHONE WIRING.

The wiring of large buildings for telephone connections requires both judgment and experience, so as to insure safety and to further convenience of installation and extension.

The "Journal of Electricity, Power and Gas" is in receipt of a request for information as to the provisions necessary in modern buildings. The Pacific Telephone and Telegraph Company has provided an outline of instructions for the use of architects. The information, the company's engineers explain, is based on practical experience of the American Telephone and Telegraph Company, of New York, where the telephone has attained its highest development.

In the wiring of hotels and apartment houses, it may be figured that one telephone will be required for each hotel room, and one for each apartment. In office buildings, it is not possible to figure so closely, since several telephones may be required for a single office, while the location of telephones in the rooms is liable to change, at the option of tenants. A much more flexible system, thus, must be provided.

In hotels, a telephone switchboard is located at some convenient point, usually on the ground floor. Telephones are placed in each room or apartment and wired to this switchboard, which is connected by one or more trunk lines with the nearest exchange of the telephone company. The wiring problem is, therefore, comparatively simple, involving the running of a pair of wires from some definite point in each room or apartment to a common center near the switchboard location. Provision should also be made so that the telephone company can run its trunk wires from the switchboard to the point at which the telephone cable enters the building from the street, usually in the basement. A two-inch conduit is usually sufficient for this purpose.

One of the simplest and cheapest methods of wiring buildings of this type is as follows:

A terminal box is placed upon each floor, at some central point convenient to a vertical pipe shaft. From this terminal box a ⅝-inch conduit is run to a designated location in the wall of each room in which a telephone is to be placed. The height of the outlets in each room should be four feet ten inches from the finished floor, this having been found to be the most satisfactory height to place the telephone. This conduit should not be over fifty feet in length, nor have more than three bends with a minimum radius of five inches. Any conduit 100 feet in length should not be less than one inch in diameter. Five-eighths-inch conduit should be provided for a maximum of two pairs of wires; three-quarter-inch conduit for five pairs; and one-inch conduit for ten pairs. In extending conduit from terminal boxes to rooms it is possible in many cases to use one run of larger conduit to supply three or four rooms, rather than run smaller conduit to each individual room. When the floor area and the number of rooms is large it may be found economical to have more than one terminal box on a floor.

From the common center, i. e., where the telephone switchboard is placed, a cable is run through the vertical pipe shaft adjacent to the boxes. The size of this cable diminishes as it extends up through the building. At each box a tap is terminated of sufficient size to provide wires for all telephones on that floor. At the common center, near the switchboard, this cable, or, in very large buildings, several cables, is terminated so that connection can be made with the switchboard. The best point for this terminal is directly back of the switchboard location. From the terminal boxes on each floor, twisted pairs of rubber insulated wire are run through the conduits to locations in each room.

In apartment houses, where only one telephone per apartment is required, a simple method of wiring is as follows: A vertical conduit is extended up through each tier of apartments, and an outlet provided in each apartment. Individual pairs of twisted rubber-covered wire can then be pulled through this conduit for each telephone. The individual wires can be carried in a cable from the bottom of the risers to the switchboard location. Of course, this system requires that the telephone location be the same in each apartment supplied from the same riser.

In large office buildings the service cables from the telephone exchange are usually terminated at some convenient place in the basement. Wiring the building for telephone service, therefore, consists in carrying a number of pairs of wires from each floor to this point. The number of wires to be provided for each floor will depend largely upon the size of the building and the class of business for which it is to be used. A rough average is one pair per 200 square feet of floor space in the financial district, and 300 square feet in the commercial districts. The most economical and satisfactory system of telephone wiring for large office buildings is believed to be the following:

One or more terminal boxes, depending upon the size of the building, are provided on each floor at points adjacent to vertical pipe shafts. Elevator shafts can frequently be used for this purpose. From the basement one or more cables are extended up through these shafts. Branch taps of sufficient size to provide for service on each floor are terminated in the terminal boxes. These riser cables and the service cables from the telephone exchange should terminate in a common main terminal in the basement, so that connections can be made easily between the two sets of cables. The terminal boxes should be placed near the ceiling, and wide shell moulding should be provided in the halls for carrying the wires from the terminal boxes to the rooms. A smaller moulding should also be provided in the individual rooms for carrying the wires to the particular location desired.

Where the wires enter the room from a hall, a piece of three-quarter-inch conduit should be furnished for carrying the wires through the partition. The conduit should either be lined with insulating material or the sharp edges around the inside of the pipe rounded off.

Where it is necessary to run across the ceiling of a hall in order to avoid either carrying the exposed wires across the finished ceiling or making a circuitous run around the hall to reach the rooms on the opposite side from the floor terminal, conduit should be installed across the ceiling before the plastering is completed, for the purpose of carrying a small branch cable to provide for such lines.

In a number of cases it has been the practice of engineers to specify rubber-covered cable for wiring buildings for telephone service. This work can be done much cheaper and better by the use of lead-covered, paper-insulated cable, such as is used by the telephone company in its subways. These cables are smaller for the same number of wires, and are less costly than cables containing wires with rubber insulation. Paper cables less than three inches in diameter, and containing as many as 600 pairs of wires can be obtained. Of course, with this type of cable, all of the terminals of the cable or its branches must be made with lead-covered, silk and cotton-insulated cables, as the paper insulation will not stand handling when exposed. Where the terminal is in a damp location it should be made with rubber-insulated wire. Shafts are much preferable to iron conduit for carrying the main riser cables, as it is difficult to make the splices between the riser cables and the floor terminal cables if the former are run in conduit.

APPROVED ELECTRICAL FITTINGS.

This department from time to time will contain an illustrated description of all fittings approved by the Underwriters' National Electric Association.

CABINETS.

Le Manquais, Style A, Cabinets for metal conduit systems. Approved March 5, 1907.

H. T. Paiste Co., Philadelphia, Pa.

N. E. Mfg. Co. slate, sheet-iron gutter, oak front, glass door. Approved January 29, 1907. Manufactured by

The Newport Mfg. Co., Newport, Ky.

Spranley & Reed. A pressed steel switch box or service cut-out cabinet. Approved Feb. 7, 1907. Manufactured by

Spranley & Reed, New Orleans, La.

CABLES, ARMORED.

Sterling. Approved April 3, 1907. Manufactured by

Sterling Conduit Co., Troy, N. Y.

CONDUIT BOXES.

G. E. "Adjustable" and "P. R." water-tight, floor outlet boxes. Cat. Nos. 76,471 and 76,459. Approved Jan. 31, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

"Simplex" floor receptacle or box. No. 3000, 3 A, 250 V. Cast-iron box, with brass floor plate and cap. Approved February 18, 1907. Manufactured by

Stanley & Patterson, New York.

Sprague, Cat. Nos. 6234 and 6235, for armored cable. Approved January 22, 1907. Manufactured by

Sprague Electric Co., New York.

Harveyduct and Interiorduct. Approved Feb. 7, 1907.

H. A. Petersen Mfg. Co., Harvey, Ill.

Sterling flexible steel conduit. Approved April 3, 1907. Manufactured by

Sterling Conduit Co., Troy, N. Y.

CURRENT TAPS.

Connecttones. Approved Feb. 18, 1907. Manufactured by

The Dale Company, New York.

CUT-OUT BASES, CARTRIDGE FUSE.

"B. P." All capacities, 25 volts, porcelain and slate bases. Approved March 2, 1907. Manufactured by

Briner-Pogue Mfg. Co., St. Louis.

"Noark," standard type, all classifications, 250 and 600 V. Approved Mar. 4, 1907. Manufactured by

The Johns-Pratt Co., Hartford, Conn.

The H. W. Johns-Manville Co., New York, Sole Agents.

"Sachs" (formerly "Arknot"), porcelain and slate bases, all capacities, 250 and 600 volts. Approved March 4, 1907. Manufactured by

The Sachs Company, Hartford, Conn.

CUT-OUT BASES, EDISON PLUG.

G. M. & S. Co., porcelain bases, 0-30 A., 250 V., all types. Approved Feb., 1907. Manufactured by

General Mfg. & Supply Co., Trenton, N. J.

Holabird, Reynolds, 0-30 A., 250 V., double pole, main to branch circuit, porcelain cut-out, Cat. No. 1935. Approved Jan. 29, 1907. Manufactured by

Holabird-Reynolds Co., Los Angeles, Cal.

FLEXIBLE CORD. Portable for Electric Heaters.

"American." Double conductor cord composed of braided conductors with rubber and asbestos coverings, protected by woven cotton braid. Approved Jan. 22, 1907.

American Electric Heater Co., Detroit, Mich.

FUSES, CARTRIDGE ENCLOSED.

"Noark." Standard type, all capacities, 250 and 600 V. Approved March 6, 1907. Manufactured by

The Johns-Pratt Company, Hartford, Conn.

The H. W. Johns-Manville Co., New York, N. Y., Sole Agts.

"Sachs" (formerly "Arknot"). All capacities, 250 and 600 V. Approved March 4, 1907. Manufactured by

The Sachs Company, Hartford, Conn.

FUSES, PLUG.

"Noark." Standard type, renewable, 0-30, 31-60 A., 250 V. Approved March 5, 1907. Manufactured by

The Johns-Pratt Company, Hartford, Conn.

The H. W. Johns-Manville Co., New York, N. Y., Sole Agts.

HANGERBOARDS, ARC LAMP.

G. E. Cat. No. 36,844, equipped with 250 V., enclosed cartridge fuse cut-out. Approved April 9, 1907. Mfd. by

General Electric Co., Schenectady, N. Y.

HEATERS, ELECTRIC.

Barr Electric Flat-Iron Co., Cat. No. 9216. Type 2 A., 4.8 A., 110 V. Approved Feb. 4, 1907. Manufactured by

W. J. Barr Electric Mfg. Co., Cleveland, Ohio.

Johns-Manville Type H, Heater No. 1, 110 V. A group of heat coils encased with perforated sheet metal and supported on iron legs. Supplied with regulating switch and approved heater cord for portables, for use on circuits supplying up to 5000 watts. Approved Feb. 18, 1907. Mfd. by

The H. W. Johns-Manville Co., New York, N. Y.

INSULATING JOINTS.

T. & B., four-prong insulating stud for straight electric fixtures. Approved March 16, 1907. Manufactured by

The Johns-Pratt Co., Hartford, Conn., for Thomas & Betts, New York, N. Y.

LAMP ADJUSTER.

"Ideal." A cord running in a groove in special porcelain ceiling block and at one end supporting single lamp socket by action of a weight hanging from other end of cord. Approved April 9, 1907. Manufactured by

Trumbull Electric Mfg. Co., Plainville, Conn.

Morse. Approved Jan. 7, 1907. Manufactured by

Frank W. Morse, Boston, Mass.

LAMP CLUSTERS.

Benjamin, porcelain bases and rings, multiple, fibre-lined, types 1, 2, 8, and K. type 7 with 250 V. snap switch. Series type 1½ and 2½, Edison bases, marked "series connected." Multiple or series, type 600. Approved Jan. 3, 1907. Manufactured by

Benjamin Electric Mfg. Co., Chicago, Ill.

G. E. All porcelain, wireless, two, three, and five-light types, both "Multiple" and "Series" connected designs, Cat. Nos. 40,517-40,522. Approved April 9, 1907. Mfd. by

General Electric Co., Schenectady, N. Y.

LAMP GUARDS.

"Hold Fast" wire lamp guard for incandescent lamps. Approved March 4, 1907. Manufactured by

Hold Fast Lamp Guard Co., St. Louis, Mo.

MOULDING.

Jordan Splice Protector. A porcelain block for branch in moulding line, 2 or 3 wire. Approved Jan. 3, 1907. Mfd. by

Jordan Bros., New York, N. Y.

"Lutz" metal moulding with metal fittings and junction box. Approved Jan. 15, 1907. Manufactured by

The American Circular Loom Co., Chelsea, Mass.

The JOURNAL OF ELECTRICITY POWER AND GAS
WITH WHICH IS INCORPORATED
The Engineers' Architects' and Builders' News

Published Weekly by

THE TECHNICAL PUBLISHING COMPANY
SUCCESSORS TO
The Journal of Electricity Publishing Company
304 Atlas Building, San Francisco.

Yearly subscription, $2.50. Single copies, 10 cts. Back numbers prior to the current month, 25 cts. Foreign subscription, $4.00.
Subscriptions cannot be begun with back numbers.
Manuscripts submitted must be accompanied by postage to insure return.

Address all communications and make all remittances payable to The Technical Publishing Company.

EASTERN AGENCIES
NEW YORK
CHICAGO
ST. LOUIS

WESTERN AGENCIES
LOS ANGELES
PORTLAND
SEATTLE

Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," with which is incorporated "The Engineers', Architects' and Builders' News."
Entered as second-class matter at the San Francisco Post Office, August 15, 1899.
Entered as "The Electrical Journal," July, 1895.
Entry changed to "The Journal of Electricity," September, 1895.

VOL. XVIII MAY 4, 1907 No. 18

EDITORIAL.

Recording, Filing and Using Engineering Data

For the engineer, data which yesterday was of great value may be of little use today, and, therefore, not available in its original form for application to present problems. For this reason text and reference books in engineering are not of the same value as are corresponding books in the field of pure science, law, literature or history. Notwithstanding the fact that changes are almost daily occurring in engineering practice, accurate and carefully selected data, no matter how old, is a necessity to the engineer in his work. General principles of design and construction remain the same, but the capacity, method of operation, and especially the cost of manufacture and construction of all machinery is subject to continuous and progressive modification.

The engineer who depends upon his memory for engineering data is certainly burdening his mind unnecessarily, and it is rare indeed that a man, no matter who he may be, can retain in sufficient detail for application data and information that comes under his observation but a single time. It is also quite impossible for the engineer to in every case remember the book or periodical in which he has seen the specific data desired at any particular time.

For this reason some form of card catalogue is found most useful to the engineer. By using cards, one of which will be used exclusively to contain the subject of the article or reference, and a brief outline of the scope of the treatment of the subject, it is possible to make available in a moment's time and with little effort, a great fund of information which is not only valuable but is a necessity for the engineer in the treatment of the many different problems requiring his attention.

A card catalogue system, however, may be so elaborately planned as to require the entire time of one man to keep it up, when in reality the card catalogue is supposed to be a saver of time. The above may be considered an extravagant statement, but when one examines many proposed card catalogue systems, it is evident that very little time will be left to the engineer who gives his personal attention to the work of making and transferring records for future reference. Duplicate and triplicate cards are, of course, necessary in order to provide cross references to cover alphabetical arrangement, grouping of subjects under common authors, and the compilation of all data pertaining to a given subject. The card catalogue system which can be put into a small space, is readily accessible and contains only sufficient data to indicate the location of the original information, is the happy medium, which is rarely found in reference schemes.

The most important records from the standpoint of the engineer are those relating to the costs of machinery, its installation and general construction work. In using such records it is to be remembered that using the costs of other work independent of the conditions existing on the particular work under consideration, especially as related to raw material and labor, may lead to disastrous conclusions in the preparation of estimates for the similar proposed new work. It is, therefore, quite necessary in such cost indices to supplement the data in every case with additional information which will be needed to adapt the figures to other work. It is not possible, as in the determination of probable economy or efficiency, to use the average cost of a number of similar instances of work, unless the conditions are practically the same.

Large manufacturing companies recognize the necessity of keeping engineers informed regarding the progress and advancement in the different lines of machinery manufactured by them. For this reason

bulletins, each copy being a part of a series, have largely taken the place of the old, bulky catalogues. Many of these bulletins are of value to the engineer and contain important data. Upon receipt of the bulletins the recipient is confronted with the problem of satisfactorily filing them away for future reference, so that they may be available when required. Everyone who has had experience with the preservation of these bulletins and catalogues has probably been dismayed and bitterly disappointed because of the amount of time and space required to preserve them in some manner so that they may be easily found when needed.

In this connection not the least discouraging feature is the fact that in all probability by the time the group of catalogues and bulletins is sufficiently large to cover much ground, a large portion of the bulletins are out of date and practically valueless.

For reports, correspondence and information of a complete nature, there is probably nothing so convenient and satisfactory as some form of vertical filing device, wherein the paper used for every purpose is of the same size. Where it is necessary to preserve drawings and blueprints, it is usually necessary to fold them so that they may be put in an envelope, properly marked and similarly filed in a vertical cabinet, in the same manner as reports. It is, of course, many times undesirable to fold drawings or even blueprints, but if any number are to be preserved in a compact space, no other plan is so satisfactory.

At the present time each individual interested in compilation and preservation of records seems to have his own system, which, in most instances, is independent of and different in character to the system used by anyone else. It must be admitted that in most cases the systems which have been thoroughly worked out and have from time to time been proposed in the technical press are so elaborate as to break down and be rendered useless on account of the enormous amount of work required to keep them in a reasonable state of completion.

The ultimate result will probably be to divide card record systems into two classes. The first class shall be brief and small in its extent, primarily for the use of the individual who himself keeps the card record system up to date and complete. The second system will be the more elaborate one, which is used by a larger number of individuals where it is possible to have all of the work of the card catalogue system in the hands of some one person, whose time may be largely or wholly required for the work of the maintenance and detail of the scheme.

ELECTRICAL CONSTRUCTION FOR THE ARCHITECT.

With this issue we inaugurate a new department of electrical construction for the architect and contractor. Under this caption we will endeavor to give in as concise a form as possible such valuable information appertaining to interior wiring for electric lights and telephones, gas piping of buildings, and a description of such electrical apparatus as has been approved by the Underwriters' National Electric Association.

These articles will be independent of all favors to the manufacturer.

The article on "Telephone Wiring" is of especial interest in the rebuilding of San Francisco, and is to be followed by others of like interest. Any questions submitted to this department will receive careful attention.

The list of approved electrical fittings includes all apparatus that has passed the Underwriters' National Electric Association since the first of January of this year. Hereafter it is to be illustrated.

PERSONALS.

Frank Fowden, manager of the Brooks-Follis Electric Corporation, has left for a six weeks' trip throughout the East.

Stanley Walton has been appointed manager of the commercial department of the California Gas & Electric Corporation.

Van Rensselaer Lansingh, engineer and general manager of the Holophane Glass Co., of New York, together with Charles A. Howe, general sales manager and A. J. Marshal of the engineering department, have been in San Francisco during the past two weeks in the interests of the Holophane Company. A branch supply house has been established in San Francisco. Mr. Lansingh has the distinction of being the first upon whom the title of illuminating engineer was conferred. Since 1901 the profession has grown until to-day it is one of the most important branches of architectural engineering.

H. P. Pitts has resigned as commercial agent of the California Gas & Electric Corporation, and will join the staff of the Great Western Power Company on May 1st.

L. W. Stocker is in the engineering department of the California Gas & Electric Corporation.

Ralph L. Phelps has severed his connection with the Telephone & Electric Equipment Company, and, after May 1st, will be the advertising representative of the "Mining & Scientific Press."

The American Supply Company has opened a sales room at 1055 Howard Street, San Francisco, where they have a large supply of electrical apparatus and sundries. In addition they carry a line of boilers and radiators for buildings.

The Electric Railway & Manufacturing Supply Company, of San Francisco, is moving from its temporary quarters, occupied soon after the fire, to 84-86 Second Street. The new salesrooms afford opportunity to display to advantage its large stock of supplies, ready for immediate delivery. Material on hand includes a large shipment of Trumbull switches, as well as all manner of telephone equipment.

INDUSTRIAL

THE ELECTRICAL INSTALLATION OF THE PROVIDENCE LITHOGRAPH COMPANY.

One of the most interesting electrical installations in Rhode Island is the power and lighting equipment of the Providence Lithograph Company, located on Prairie avenue, at the corner of Reynolds avenue. All the machinery is electrically driven, in most cases direct-connected motors being used. Power is supplied by the Narragansett Electric Light Company, of Providence. In every particular the installation bears the mark of careful designing and excellent construction. In its adherence to the direct rather than the group drive, the plant is a typical instance of the latest practice.

FIG 1.—MOTOR-DRIVEN LITHOGRAPH PRESS.

The building is a one-story brick structure, consisting of a workshop section, 300 feet wide by 100 feet long and an office 100 feet square. In order to provide a solid foundation for the heavy machinery, the floor in the press and cutting rooms was built of ⅞-inch maple planks laid on 3 inches of hemlock, the latter resting on 6 inches of concrete. No vibration is apparent when the machines are in operation. Beneath the floor of the work room on the Reynolds avenue side of the building is a fire and moisture-proof vault for the storage of lithograph stones and plates. This vault is divided into sections, each section being lighted by two 16-candlepower, 250-volt lamps, so that any plate or stone can be quickly found in its numbered compartment. The temperature of the vault is kept at about 70 degrees F. by steam heat, it being essential for the proper storage of the stones that no moisture be allowed to gather upon their surfaces. The building is lighted by 250-volt incandescent lamps, supplemented by enclosed arc lamps for general illumination. The current supply for the lighting circuits is single-phase. The lamp and switch fittings in the vault are of the marine type. The switches are operated by pendant cords of non-conducting material so that there is no danger of shock in case an outside line becomes crossed. About 200 16-candlepower incandescent lamps are in service. The quality of work in the plant renders good lighting of the first importance; the larger part of the company's output consisting of colored illustrations for religious and secular educational work. Abundant natural light is, therefore, provided by saw-tooth skylights admitting north light and numerous large windows. In addition the interior walls are painted white.

All the motors are of the direct-current type, and operate at a potential of 500 volts. Motors rated at one-half horsepower or less are of Holtzer-Cabot type "E" design; larger motors are of type "SE" design, characterized by extreme shortness along the shaft axis, and by large startinfi torque. The result is a very narrow motor, which in many cases can be set inside the floor area occupied by the driven machine and installed so that no part of the motor projects into the aisle space. The compactness of this motor can be seen in the accompanying illustrations of lithographic presses and cutters, comparing the size of the motor with the driven machine. The motor wiring is carried in iron conduit. Special care was taken to avoid introducing shadows caused by installing wires between the machines and the skylights.

The service wires are brought in on the Reynolds Avenue side of the building. The entering cables are carried in iron conduit through and down the wall to the floor and thence to

FIG. 2.—MOTOR-DRIVEN LITHOGRAPH PRESS. THREE-COLOR.

two switchboard panels set up in one corner of the cutting room. The motor service is of No. 2 wire and the lighting service of No. 4 wire. The service boards are of slate, separately mounted. One is given up to motor service and is 32 inches high, 30 inches wide and 1½ inches thick. The lighting panel is of the same dimensions. The panels are mounted 12 inches apart, with a clearance of 24 inches between the panels and the nearest parallel wall. Terminal connections were specified for a minimum capacity of 100 amperes per square inch. Each panel is equipped with ammeters, a recording watt-hour meter and the usual knife switches and enclosed fuses. All mains larger than No. 7 wire are held taut by strain insulators on runs of 50 feet or more, straight-away. Motor-starters and controllers are placed within easy reach of each operator. On the presses the controller resistance is detached, and push buttons are provided, one at the head end and one at the opposite side of each press, for stopping the presses quickly. Motors placed on the floor are set over zinc pans.

There are about thirty motor-driven machines in the plant, which is divided into a pressroom and a cutting room section, with sub-departments in addition. In the pressroom are seven direct-driven lithograph presses. One is a tri-color press, giving 1,200 impressions per hour. This is direct-driven by a 5-horsepower motor. The speed of the motor ranges from 700 to 1,000 revolutions per minute, and full load current is 8 amperes. The motor is capable of 100 per cent. overload temporarily, in starting and "inching" with the

brushes fixed. All the press controllers are arranged to give two reverse speeds and are fitted with four armature resistance points for use in forward starting and ten field points for running at different speeds. A novel feature of the control is the use of a variable resistance in parallel with the series winding for speed regulation, in place of the usual variable resistance in the shunt field circuit. No external armature resistance is used in regulating the speed, but the entire control is effected by the variable shunt around the series coil. In driving presses constant speed for any given class of work is important, and the arrangement of altering a resistance in parallel with the series turns was introduced by Mr. Kelley's specifications as a better means of obtaining uniform control than the older plan of weakening the shunt field. It is

FIG. 3.—MOTOR-DRIVEN COLLATOR WITH PUSH BUTTON STOP

undesirable to apply a motor having the characteristics of a series-wound machine to a press, on account of the variation of speed with load, and the plan of shunting the series coil makes the motor act more and more like a pure shunt motor as the shunt around the series coil is made of less and less resistance. Each starting box is equipped with a no-voltage release and has sufficient resistance to start the motor from rest at full load without exceeding 1.75 times full load current. All the controllers are designed so that the attendant cannot get a shock in handling them from any point about the presses. A recent test of the motor driving the tri-color press showed a current consumption of 5 amperes on the first running point, the speed being 625 revolutions per minute. On the last running point the motor was making 900 revolutions per minute, the current being 7 amperes. A two-color press is direct-driven by a 3.5-horsepower motor, having a speed range of from 700 to 1,200 revolutions per minute. This press will easily make from 1,000 to 1,600 impressions per hour maximum. The motor has a full load current of 6.25 amperes and an overload output of 7-horsepower. In a test of the power consumption of this press the motor took 4.1 amperes, the press making 720 impressions per hour and the motor speed being 625 revolutions per minute. On the first speed point of the controller (second running point) the motor took 4.4 amperes, the press making 900 impressions per hour, and on the second speed point the motor consumed 4.5 amperes, 1,000 impressions being run off the press.

Five single-color presses are each driven by a 2.5-horsepower motor, the full load current of which is 4.54 amperes. These presses have a maximum capacity of 1,800 impressions per hour. In a test on one of these presses the motor consumed 3.4 amperes on the first running point, 1,260 impressions per hour; 3.7 amperes, fifth running point, 1,440 impressions, and 4.4 amperes, eighth point, 1,620 impressions.

Another representative test on a straight lithographic press of the same make gave the following results:

Running Point.	Amperes.	Impressions Per Hour.
1	3.4	1,160
2	3.5	1,200
3	3.6	1,320
4	3.7	1,380
5	3.9	1,440
6	4.1	1,500
7	4.2	1,560
8	4.3	1,620
9	4.4	1,680
10	4.5	1,770
11	4.6	too fast

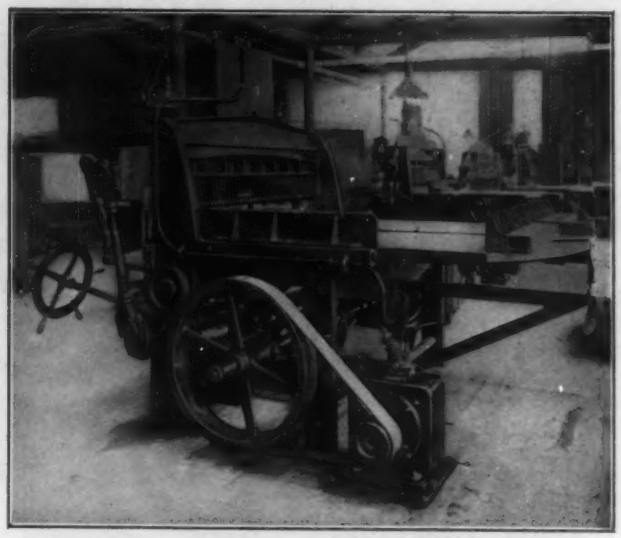

FIG. 4.—MOTOR-DRIVEN PAPER CUTTER.

On the five single-color presses mentioned, the motor overload output is 5.5-horsepower. An interesting feature of the press equipment is the arrangement of a tell-tale signal on the wall behind each press to show when a press is over or under-speeded. In each controller is a contact which the foreman sets at the proper speed for each job, and if the operator changes the speed two lamps on the wall are lighted, showing the foreman that something is wrong. The device is of considerable importance in keeping the production of each machine at a maximum. Each controller is fitted with an overload release and each motor with a dynamic brake, which short-circuits the armature when current is cut off from the motor, bringing it to an immediate stop.

The plant contains one 42-inch by 64-inch bronzing and one dusting machine, both of which are driven through belt and line shafting by a 3-horsepower motor running at a speed of 1,025 revolutions per minute. There is also a small washing machine in this equipment.

The cutting room contains a large assortment of machinery. There are two 60-inch paper cutters, each of which is direct-driven by a compound-wound, 3.5-horsepower motor, whose speed is 1,200 revolutions per minute.

The full-load current of the motors is 6.2 amperes. On a test of one of these, the motor took 2.1 amperes with the cutter running free on the shaft and fly wheel and 6½ amperes average, making a heavy cut of paper. The range of the ammeter needle was 5.7 amperes.

Two 50-inch paper cutters are also in service, each direct-

driven by a 2-horsepower compound motor, with 3.6 amperes full load current and 1,200 revolutions per minute motor speed. In a test on one of these cutters 2.4 amperes were required to cut stock 36 inches wide and 1¾ inches thick, and 3 amperes for 36-inch by 2⅞-inch stock. Running free with shaft and fly-wheel the cutter required 1.4 amperes. In this department are also one tube machine with a 36-inch roll, driven by a 1-6-horsepower motor; an embossing press driven by a 1½-horsepower motor of 725 revolutions per minute normal speed; three wire stitchers, each driven by a 1-6-horsepower, 1,200 revolution per minute motor; one folding machine driven by a ½-horsepower motor; a circular saw driven by a 3½-horsepower, 1,500 revolution per minute motor; two cutting-out presses, each driven by a 1-horsepower, 600 revolution per minute motor; three collators, each direct-driven by a 1-6-horsepower, 400 revolution per minute motor, and a large collator, driven by a ½-horsepower, 600 revolution per minute motor at a speed of 3 revolutions per minute. The last machine is extremely useful in enabling the different lithographs in a series to be placed in order for binding. A vertically-revolving wheel contains fourteen carriages, twelve

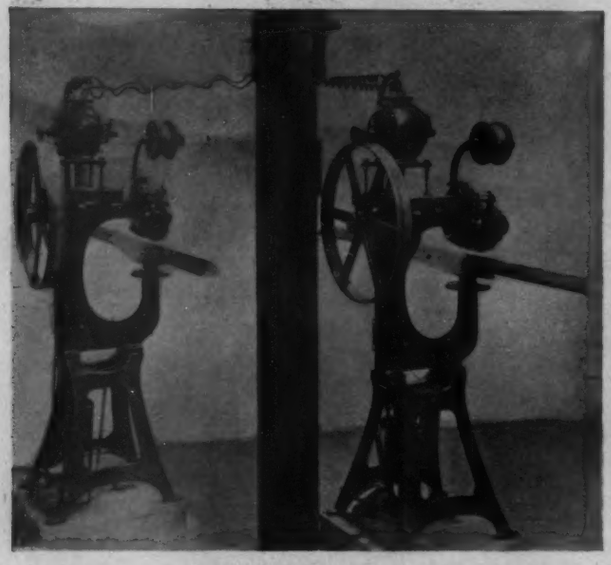

FIG. 5.—WIRE STITCHING MACHINES, FOOT CONTROL.

for illustrations and binding. On each carriage is a pile of similar lithographs, and as the wheel revolves an operator picks one sheet off each carriage in the order of rotation, so that at every complete revolution of the wheel a complete set is collated. The three collating machine motors are each built in a ½-horsepower frame and wound for 1-6-horsepower to give the slow speed required, 400 revolutions per minute. These and the wire stitcher motors are shunt-wound machines. The development of such small shunt motors as 1-6-horsepower on 500 volts is one of the notable things of this interesting plant. There is also in this room a knife-grinder driven direct by a 3.5-horsepower motor, making 1,200 revolutions per minute. The plant has in addition three graining machines and a stone planer group driven by a 3.5-horsepower motor, and a lithographic hand press driven by a 1-horsepower motor. In one section of the workshop is a stock room, in which is an ink mill driven by a 7.5-horsepower motor. The mill is used in grinding inks and is a notable time saver.

In one portion of the shop a room for photographic work is being fitted up, and to enable pictures to be taken on dark days or at night two 30-volt, 25 amperes, automatic photo-engraving arc lamps, built by C. J. Bogue, of New York City, are installed. The entire plant is equipped with automatic sprinklers of the Grinnell type.

In the design of a motor-driven plant it is often difficult to estimate correctly the time a machine is in actual operation. The owner often believes his machinery to be in service a much longer time than is the case. As a matter of fact, it is frequently found that a machine to be used in a specialized industry is not in use more than 25 per cent of the year. In this particular case the estimates of the designing engineer were based on partial power tests, and the statements of the lithograph company as to the time it thought the various machines would be in operation. These data as modified by the judgment of the designing engineer, resulted in a tolerably close estimate of the use of current. The great advantage of the direct drive in using power only when the driven machine is at work is plain from his figures of estimated hours' use per month for the following machines:

Ink mill	100	47
Bronzing machine	75	35
Cutting-out machine	80	38
Knife grinder	50	24
Embossing machine.	80	38
Circular saw	100	47
Graining machine	150	71
Collating machine	200	94
Mailing tube machine.....	150	71
Stitching machine	150	71
Transfer presses	50	24
Oswego cutter	75	35
Rotary press	105	49
Lithographing press	116	55
Combination press	86	41
Two-color press	150	71
Three-color press	120	57

MOTOR-DRIVEN PAPER CUTTER, SHOWING METHOD OF WIRING FOR CONVENIENT STARTING.

The estimated maximum energy consumption in kilowatt hours for the plant as installed was 3,566, and the minimum 2,559. The actual figures for the first four months were: February, 3,090; March, 2,680; April, 2,740; May, 3,300 kilowatt hours, the average being 2,952 kilowatt hours.

The plant is owned and operated by Messrs. Harris, Jones, & Co., of Providence. The liability insurance inspector pronounced it "the best arranged, most complete and satisfactory" from a liability standpoint of any that he had examined.

The architects for the building were Messrs. Lockwood, Greene & Co., of Boston, and the installing electrical contractors were Lindsley & Allen (Inc.), of Providence. All the motors were supplied by the Holtzer-Cabot Electric Company, of Boston (Brookline Station), and the controllers by the Cutler-Hammer Company, of Milwaukee. The lighting equipment was furnished by the General Electric Company through the Narragansett Electric Light Company, and the designing engineer for the installation was Mr. Walter Stuart Kelley, now chief engineer of the Holtzer-Cabot Electric Company. Mr. J. H. Smith, one of the firm, is superintendent of the plant.

A NEW PORTABLE COMBINATION METER.

The unique combination of a voltmeter, ammeter, wattmeter and horsepower meter in one instrument, is accomplished in the "Victor" Combination Meter, manufactured by the H. W. Johns-Manville Co. This instrument was first placed on the market somewhat over a year ago, and, from the large number of inquiries and orders received, it has evidently filled a long-felt want.

It was first designed for switch-board use in central stations, and the success of the instrument for this purpose has recently led to the placing on the market of a portable form for general electrical testing, an illustration of which appears above.

The "Victor" meter consists of two separate and complete instruments in a single case, the one giving readings in volts and the other in amperes. The third and fourth readings are obtained on a scale plotted at the center of the dial, giving the product, or power consumption, in watts or kilowatts and horsepower. These readings are taken at the points of intersection of the two indicators. The power

scale is calibrated in "watts" or "kilowatts" on one side and "horsepower" on the other.

The convenience of having in one instrument a portable meter giving readings in volts, amperes, watts and horsepower is readily appreciated at a glance, as this meter is adapted for rapid testing in the laboratory, while for field work it is almost indispensable. It has been found especially suitable for taking readings on electric cars, electric elevators, etc.

If desired, multiple shunts and extra multipliers will be furnished in connection with the volt and ampere scales for additional readings, and a table, containing the multiplying factor to be used with these various combinations, when reading the central scale.

The workmanship and materials used in the manufacture of the "Victor" meter are of the highest class. The calibrations are carefully and accurately made, and the instrument is reliable and permanent.

TRADE CATALOGUES.

Bulletin No. 1057 from Allis-Chalmers Co., introduces their type "K" motors, which supersede types "N" and "B" d. c. motors, that can be applied either to the individual or group drive of machinery.

PRESERVATION OF WOODEN POLES.

Experiments made by the Austrian telegraph authorities in the preservation of wooden poles will interest American engineers. Until recently all the telegraph poles used were prepared by impregnation with copper sulphate. This process gave very good results for some years, especially in the case of new lines, but it gradually became apparent that in the case of older lines the necessity for replacement of poles became more and more frequent—the life of a pole being reduced to only two or three years. The cause of this has been proved to be the presence of fungi which, in course of time, infest the ground around the old poles, and then rapidly attack the new ones. Experiments in various directions were undertaken, and attention was directed to the Bethell process for impregnating wood with creosote. By this process pine wood can be made to absorb as much as 300 kilogrammes of oil per cubic meter of wood. The cost of this large quantity of oil, together with that of the special apparatus involved, add largely to the expense of preparing the poles, whilst the fact that the oil oozes out and overspreads the surface makes the handling of poles treated in this way inconvenient and difficult. To avoid these difficulties, other processes have been devised by which a much smaller quantity of oil than the maximum which the wood can absorb is forced in Rutger's process, for instance, is similar to the Bethell process, but after the wood has absorbed about 100 kilogrammes of creosote per cubic meter the action is stopped. The remaining oil is then withdrawn and superheated steam admitted, which drives the oil into the interior, and at the same time dries the surface. In this way the cost of preparation is little more than for the far less effective copper sulphate impregnation. Poles treated in this way and erected in 1904 were not quite dry on the surface, and, when exposed to the sun, oil was still found to ooze out. This difficulty was overcome by employing only thoroughly dried wood with a clean surface wholly free from bast. It is impossible as yet to say whether this cheaper treatment will be as effective as the saturation process, but this seems likely from the fact that the top and bottom parts of the posts in any case become thoroughly impregnated, and these parts are the ones chiefly attacked. In the central parts of the pole the amount of oil absorbed and the distance to which it penetrates depend largely on the state of dryness of the wood. Of forty-seven of these creosoted poles erected in 1904 in fungus-infected ground, all were still perfectly sound in 1906, whilst out of thirty-seven poles impregnated with copper sulphate and erected at the same time in the same ground, twenty-three, or sixty-two per cent., have already had to be replaced through the attacks of fungi. The annual extensions and replacements on the Austrian telegraph lines call for some 150,000 poles, and this large demand obviously justifies considerable experiment. Thus experiments are being made with a view to the employment of the larches of the Alps for this work. Experiments are also being made with other more direct antiseptic liquids in place of creosote. Besides copper sulphate such preservative compounds which are soluble in water and, therefore, suitable for use in the Boucherie process, include bichloride of mercury, zinc chloride, and zinc fluoride, both of which are to be tried by the Austrian Government during 1907.

Oakland, Cal.—The Western Union Telegraph Company has been granted permission by the Board of Public Works to place its wires on Broadway from Seventh Street to its main office in underground conduits. This is in line with the work of removing all overhead telegraph, telephone and electric light wires in the business district under an ordinance which was passed several years ago.

NEWS NOTES

TRANSMISSION.

Chihuahua, Mex.—The great hydro-electric enterprise projected on the Conchos River at La Joya is to be carried out now, according to the statement of Engineer Tye, of the Canadian Electric Syndicate, of Montreal, Canada.

Redding, Cal.—Sometime this week a test will be made at the plant of H. H. Noble, on Pit River, in this county, of smelting iron ore by electric heat. Should success attend the test now, the work of installing a plant with a capacity of handling 500 or 1,000 tons of ore per day will be undertaken at once.

Reno, Nev.—Engineers Thurston and Campbell, representing Boston capitalists, arrived here from Southern Nevada last week, after making an inspection of the Colorado River for power purposes. They have been inspecting the mining camps, which they proposed to serve with one of the greatest systems ever built on the Coast.

Nevada City, Cal.—There is a big break in the Milton Ditch on the Bloomfield side of the ridge, near Lake City, and the Northern California Water and Power Company has quite a task before it in repairing the damage. A pipe line will be constructed across the place where the landslide has broken the ditch.

Redding, Cal.—The Northern Light & Power Company has made application for a franchise granting it the right to construct and maintain pole lines along the public highways and through the streets of unincorporated towns of the county. The Board of Supervisors has ordered that the regular advertisement be made. The Northern Light & Power Company, which was incorporated three months ago, proposes to develop 7,000 horsepower on Cow Creek. The Pacific Power Company, another enterprise, is erecting a power house on Battle Creek, but it has not yet asked for a franchise. The Shasta Power Company is nearly ready for business. Ten thousand pounds of wire were received in Redding last week and 90,000 more are coming. The wire will be stretched on the poles, which are in place all over the city.

Eureka, Cal.—Keen competition leading to rate cutting may be the outcome of the announcement of the plan of the North Mountain Power Co., that it will construct a gas plant here to compete with the Eureka Lighting Co. The announcement that the North Mountain Co. would enter the gas business has stirred up no little activity in the camp of the local company. Its representatives argue that there is not enough business in town to support two companies and one must succumb. In the eyes of the Eureka Lighting Co. the other corporation is simply bluffing in the hope that it will succeed in taking over the Eureka company's plant at a small figure. If the declaration of the North Mountain Co. is carried out, the rate war will begin. Superintendent Patch of the local company says: "I do not believe that our city is and will not probably be in the near future, large enough to support two gas companies. The inevitable result will be that the people of Eureka will have to pay a much larger rate for both gas and electricity on account of the large amount of capital invested in two gas plants. One thing can be relied on, however, that this company will hold the field it has occupied so long at any cost."

TELEPHONES.

Spokane, Wash.—The Interstate Tel. Co. is extending its line to East Greenacres.

La Conner, Wash.—The Skagit Valley Tel. Co. has ordered a new 100-line switchboard.

Kendrick, Ida.—The Taney Telephone Company has been incorporated with a capital of $1,000.

Maple Falls, Wash.—The Maple Falls Tel. Co. is stringing wires on its line from this place to Deming.

Vancouver, Wash.—The County Commissioners granted franchises to the Amboy Tel. Co., also the La Center and View Tel. Co.

Seattle, Wash.—City Electrician Howard Joslyn is installing 25 new police patrol report stations in the residence districts of the city.

Boise, Ida.—General Superintendent H. Sommers, of the R. M. Bell Tel. Co., states there will be extensive improvements in the system for this divisions within the next four months.

Bellingham, Wash.—The Sunset Tel. Co. has assisted in the establishment of a telephone company on Whidby Island in the Langley district, which will have 80 miles of line and will connect with this place.

Dillon, Mont.—The Centennial Tel. Co. has been organized with a capital of $20,000 by Robert T. Boatman, A. C. Wakefield and Pearl I. Smith. The company will build a line through the Centennial Valley from Monida to Lakeview.

New Westminster, B. C.—The farmers of Delta municipality have organized a telephone company and will at once commence the construction of a line twenty miles in length. H. M. Basey is at the head of the company.

Vancouver, B. C.—Work has been commenced on the construction of the Coquitlam and Burnaby Telephone Company's lines, which will extend from this place through Burnaby, New Westminster, Coquitlam and the Fraser valley to Chilliwack.

INCORPORATIONS.

Santa Barbara, Cal.—Three new oil companies, the New Pacific, the Mountain, and the Bickmore, have filed articles of incorporation here.

San Francisco, Cal.—The Metropolitan Light and Power Company has filed certificate of increase of stock from $5,000,000 to $10,000,000.

Redlands, Cal.—The Linda Vista Water Company has been incorporated here with a capital stock of $24,000, all of which has been subscribed.

San Rafael, Cal.—Chas. Harrison, a millionaire mining man from Mexico, and F. P. Howard, a local capitalist, are about to form a corporation for establishing a new water system in this part of the county and southern Marin. The Howard estate has several watersheds that could be used to supply many places with water.

POWER AND LIGHT.

Aberdeen, Wash.—W. W. Seymour, of Tacoma, has purchased the plant of the Grays Harbor Gas Co., for $100,000.

Ballard, Wash.—Council granted a franchise to Henry Drum to furnish power and light to a number of manufacturing plants.

Chelan, Wash.—The Chelan Electric Co. has purchased the plant of the Chelan Electric Light and Water Co.

Falls City, Ore.—Council has decided to expend $50,000 in installing a new light system.

Freewater, Ore.—The Walla Walla Valley Traction Co. has decided to build a sub-station at this place.

Olympia, Wash.—Council granted a franchise to W. F. Dole, of Portland, for the erection of a gas plant here.

Olympia, Wash.—The Olympia Gas & Light Co. has purchased a site at corner of First and Columbia Streets, for the erection of a new gas plant.

Oregon City, Ore.—Douglas Taylor has filed notice of appropriation of 4,000 inches of water from Still Creek and Zigzag Creek to develop electric power.

Portland, Ore.—The Portland Ry., Light & Power Co. will build an electric transmission line from Oregon City to Salem.

Seattle, Wash.—The Seattle-Tacoma Power Co. will enlarge the capacity of their plant at Snoqualmie Falls this season. The output will be increased from 4,000 to 10,000 horsepower.

FINANCIAL.

San Francisco, Cal.—Rumors that the United Railroads of this city are for sale are emphatically denied by President Calhoun, of the company. He admits that he has received offers from Eastern capitalists, who have a false impression that the stock may be bought for a bargain From New York comes another denial that there is in progress negotiation for the sale of the company to Thomas F Ryan, the street railway magnate there.

San Francisco, Cal.—Spring Valley's financial straits, its lawsuits that have covered years and are still unsettled, and all its controversies with the city and the rate payers, are to be settled with one fell swoop, if the permanent committee of allied commercial associations can carry out its plan. Representatives of twenty-three commercial associations and improvement clubs met recently and discussed the problem of the city's water supply, both in its immediate aspect and future necessity, and approved a plan, which, if successful, will please the Spring Valley officials, the city government and the rate payers. The proposition is for an appraisement of the system of water supply owned and operated by the Spring Valley Co., this appraisement to be used in arriving at a water rate which will earn 5 per cent to the company, and also to be used as a basis for an option for the sale of the company's plant to the city at some time within the next ten years. All litigation is to be ended. After having agreed to the proposition the water company would be able to sell bonds and provide an adequate supply for the immediate needs of the city, and when the supply from the Sierras is inaugurated the city is to purchase the Spring Valley system and use its network of delivery pipes for the distribution of the water that is to be brought from the mountains.

Oakland, Cal.—The committee of the whole recommended last week at the meeting of the City Council that a water rate be adopted for the coming year, which is a ten per cent reduction on the rate paid last year. Besides this, the rate for the municipality will be 20 per cent lower, and the cost of supplying hydrants will be reduced from $5 to $3 if the recommendation of the committee be approved by the Council and accepted by the Peoples' Water Co. That it will be approved is made practically certain by the statements of Louis Titus, president of the company. He was questioned at length by members of the Council, and admitted that the reduction was a fair one. It is understood that the rates as recommended by the committee will be the ruling rates for the coming year. Titus said that to provide more water, more than $2,600,000 had already been spent during the past year in actual construction, purchase of land about Lake Chabot, and about San Pablo Creek. The new San Pablo system, which will be used exclusively for Oakland when it is completed, will cost $4,000,000 in all, and will be able to furnish 8,000,000 gallons of water daily. In fixing the rates the Council will, however, increase the valuation of the plant by the amount that Titus said had been spent in improvements during the past year, which amounts to more than $2,600,000, making a total valuation of $9,600,000 in round numbers. The rate actually paid in the past has been on $7,000,000 valuation fixed by the decision of Judge Hart.

TRANSPORTATION.

Fresno, Cal.—The surveying of the Fresno-Yosemite electric line is about completed. Another month's work will see it finished. Maps have been made as the survey progresses, and by the time it is completed all the data will be available for use in financing the project. The Pollasky Road, belonging to the Southern Pacific, will be used from Fresno to Pollasky and from there to the valley the new line will be built.

San Bernardino, Cal.—An electric railway from Redlands to Riverside, with another branch to Craftonville, is being promoted by Redlands capitalists, who have organized the Redlands Central Railway Company. Articles of incorporation were filed April 19 with the capital stock stated at $100,000. It is believed here that the new road will ultimately be extended to all parts of the valley and become a rival to the Huntington system, which includes the San Bernardino Valley Traction Company and the Riverside-Arlington Electric Company.

Stockton, Cal.—By June 1st people from here may go by rail to Lodi via the Central California Traction Company. Lew Moreing has a contract to build the road before that time. Active operations have been already commenced. This is the first step toward the construction of an electric system, which is expected to be important. It is claimed that the Central California Traction Company is co-operating with the Northern Electric Company, which is connecting Redding with Sacramento, and that in the near future it will be possible to make the trip from here to Redding by electric rail. From Lodi the Traction Company is expected to continue its construction work until it connects with the Northern Electric Company, near Sacramento.

Stockton, Cal.—The Central California Traction Company, which is building an interurban line between here and Sacramento, must bid at public auction for the franchise it desires to carry freight over the streets for which it has already obtained a passenger franchise. This is the result of the decision rendered by Superior Judges Frank Smith, W. B. Nutter and C. W. Norton in the friendly suit brought by the traction company to determine the legal interpretation of the city charter. The question arises, if the freight franchise is sold to the highest bidder, and that person or corporation happens to be other than the Central California Traction Company, will the purchaser be entitled to haul freight over the tracks of the company now in possession?

ELECTRIC RAILWAYS.

Bellingham, Wash.—Stone & Webster are making preparations to rush work on the Bellingham-Skagit County interburban railway.

Seattle, Wash.—Council granted a franchise to the Seattle, Renton & Southern for the operation of railway lines on streets of the city.

Tekoa, Wash.—F. J. Mahoney of the Tekoa & St. Maries Railway Co. states that work will be started at once on the project. The road will be fifty miles in length.

Port Angeles, Wash.—Arnold Zinden, H. B. Kennedy and Fred A. Ballaine, of Seattle, have applied to Council for a franchise for a system of street railways.

Libby, Mont.—J. H. Geiger has returned from the East, where he has secured the money for the erection of the projected line from this place to the Fisher country.

Boise, Idaho.—The Boise Interurban Railway Company has commenced the erection of a car barn 50x150 feet with a 25x40 machine shop at Park, four miles down the valley.

North Yakima, Wash.—Construction work has been commenced by the Inter-valley Traction Company, under Engineer Kenley. A system 250 miles in extent is contemplated.

Missoula, Mont.—Fred C. Soddard has been appointed special right-of-way agent for the Missoula-Bitter Root Traction Company. The new road, which will extend from this place to Hamilton, is now assured.

Seattle, Wash.—The County Commissioners granted a franchise to the Seattle Electric Co. for an extension of the Rainier Heights line to Rainier Beach; also for the extension of the South Seattle line over Michigan avenue to Oxbow.

Bakersfield, Cal.—The independent producers of the Coalinga and Kern River oil fields are hard at work on the plans for their pipe line to be built from the local fields to Coalinga, and from there across the mountains to tide water near San Jose. As a start for the immense sum needed the independent producers' agency of the local field has set aside $140,000, which was received on April 20th from the Associated oil companies as the second payment on the contract of the independents with that concern. This money will be used as a nucleus for the portion which the producers of the Kern River fields will furnish for the pipe line. The cost of the line will be about $7,500 a mile for 225 miles, and this expenditure will be shared by the local and Coalinga producers. A meeting was held in Coalinga on May 3d to discuss ways and means for the enterprise. Timothy C. Spellacy, W. B. Robb, L. P. St. Clair and F. M. Scofield attended as representatives of the local producers' agency.

THE SCHAW-BATCHER COMPANY PIPE WORKS

INCORPORATED

Manufacturers of

RIVETED IRON AND STEEL PIPE

Tanks of all descriptions for Water, Oil and Gas.
Single and Double Well Casing.
Our Specialty: Riveted Pipe for High Pressure.

Engineers and Contractors for the complete installation of Pipe Lines used in the operation of Hydraulic Mines, Power Plants, Water Works, Irrigation, Reclamation, etc. We have special facilities for supplying general supplies for Mills, Mines, etc.

Office, 211 to 219 J St. Works, 15th and Sts.

SACRAMENTO, CAL.

San Francisco Office - - 305 Market Street
New York Office - - - - 65 Reade Street

FOR SALE

425 Shares of the capital stock of the Farnsworth Electrical Company. Established 1901.
Doing a flourishing business. 1175 shares issued. Five directors. Apply M. A. Farnsworth, 16-18 Natoma Street, San Francisco.

New York Insulated Wire Company

NEW YORK BOSTON

Rubber Covered Wires
Grimshaw White Core
Raven White Core
Telephone, Telegraph, High-Voltage, Lead-Covered Cables

Complete Stocks Standard Sizes Carried in San Francisco

CHICAGO SAN FRANCISCO

Friction and Rubber Tapes
Grimshaw Tapes, White & Black
Grimshaw Splicing Compound
Competition Splicing Compound

Made in any width up to 36 inches

John R. Cole Co., Pacific Coast Sales Agents.